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TRANSMITTAL FORM *(to be used for all correspondence after initial filing)*	**Application Number** 09/683,713
	Filing Date February 6, 2002
	First Named Inventor Hilmar Gugel
	Art Unit 2872
	Examiner Name Nguyen, Thong Q.
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ENCLOSURES *(Check all that apply)*

- [✔] Fee Transmittal Form
  - [ ] Fee Attached
- [ ] Amendment/Reply
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  - [ ] Affidavits/declaration(s)
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Date	July 20, 2004

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re:	Hilmar Gugel, Joerg Bewersdorf and Stefan W. Hell	Confirmation No:	8638
Serial No:	09/683,713	Group:	2872
Filed:	February 6, 2002	Examiner:	Nguyen, Thong Q.
For:	Double Confocal Scanning Microscope	Customer No:	29127
		Date:	July 20, 2004

APPELLANTS' BRIEF

Mail Stop Appeal Brief- Patents
Commissioner for Patents
P.O. Box 1450,
Alexandria, Virginia 22313-1450

Sir:

This is the Applicants' appeal from the final Office Action, mailed January 20, 2004.

Real Party of Interest

Leica Microsystems Heidelberg GmbH, Inc. is the real party in interest.

Related Appeals and Interferences

There are no related appeals or interferences.

Status of Claims

Claims 1,3,4,6 and 8-16 are pending in this application. Claims 1,3,4,6 and 8-16 stand finally rejected pursuant to the outstanding Office Action.

Status of Amendments

All amendments have been entered. There were no post final amendments or proposed amendments.

Summary of the Invention

From the Abstract: The present invention concerns a double confocal scanning microscope having an illuminating beam path (1) of a light source (2) and a detection beam path (3) of a detector (4), in order to eliminate at their cause the problems of reconstruction methods. To do so, at least one optical component (24, 25) acting on the illuminating and/or detection beam path (1, 3) is provided, and is configured in such a way that it influences the amplitude and/or phase and/or polarization of the light; and the characteristics of the double confocal illumination and/or detection are thereby modifiable.

Issues

1. Whether claims 1, 3-4, 6, 8, 10-12, 14 and 16 are anticipated under USC 35 102(b) or, in the alternative, are obvious under 35 USC 103(a) over Dixon et al. (U.S. Patent 5,760,951, "Dixon").

2. Whether claims 1, 3-4, 6, 8-12 and 14 are anticipated under USC 35 102(b) or, in the alternative, are obvious under 35 USC 103(a) over Engelhardt et al (DE 19914 049 A1).

3. Whether Claims 9, 13, 15 and 16 are obvious under 35 USC 103(a) over Engelhardt et al. in view of Krause (U.S. Patent 5,587,832).

Grouping of Claims

First Group: 1, 3-4, 8-10 and 14; grouped solely for reasons of this appeal.
Second Group: 11-13 and 15-16; grouped solely for reasons of this appeal.
The reasoning required under 37 CFR 1.192(c)(7) is provided below.

Argument with respect to the First Group

In an optical system, such as the one claimed in independent claim 1 and the dependent claims of the fist group, the wave property of light defines certain resolution

limits of such optical system. The image of a point in the focal plane of an optical system becomes not a single image point, but a point characterized by a probability distribution over a possible area in the image plane. The probability to find an image point over the possible area in the image plane is called the point spread function (PSF).

The Patent Office asserted that "the use of half-wave plate and polarizer in each of the illuminating light path and/or the detecting light path in combination will cause an overall point spread function which will inherently change the axial positions of the secondary maxima of the overall point spread function." The Patent Office asserted that the use of optical elements such as a polarizer and a half-wave plate inherently modifies the axial position of the PSF's secondary maxima, as claimed in claim 1.

Applicant asserts that such a conclusion is incorrect as a matter of physics. The reasons are the following: consider a point (or a tiny volume) located in the focal plane. The image of that point on the image plane becomes not a single point, but a point characterized by a probability distribution over a possible area in the image plane. The function characterizing that probability distribution is called the point spread function (PSF), which looks like the function in Fig. 3 of the present application. It is symmetrical relative to the principle maximum, and its lower secondary maxima are located as shown in Fig. 3.

A polarizer is an optical component that restricts the direction of oscillation of the electrical component of the electromagnetic wave to a particular direction. A polarizer doesn't create or change these oscillations, but resolves an incoming beam into polarized components and selectively does or does not transmit them.

A wave plate divides an incident polarized beam into two components, changes the phase of one relative to the other while a beam passes via the wave plate and recombines the two components as they exit the wave plate. Specifically, a half-wave plate rotates linearly polarized light by a certain angle (which is twice the angle of incidence of the beam onto the half-wave plate). Again, all that happens is that a direction of oscillation of the electrical component of the beam is changed.

Nothing that happens with the light beam while it passes through a polarizer or a half-wave plate in Dixon affects the probability of where a point in a focal plane will be imaged in the image plane. In other words, nothing that happens to a light beam after it passes through a polarizer or a half-wave plane in Dixon affects <u>the location of the secondary maxima</u> of its PSF. The secondary maxima remain at the locations where they were in the PSF before the beam passed through the optical components of Dixon. This is a logical result, because the probabilistic characteristics of <u>where</u> an image point can be found over a certain area on the image plane (which is determined by the location of the peaks on the PSF) is not the kind of modification of the shape of the PSF relevant to such properties as polarization, amplitude or phase, even though such properties can be modified by the optical system in Dixon.

Claim 1 is directed to a microscope with an optical element which modifies the PSF to produce a modified PSF "wherein its secondary maxima of the modified PSF are located in different axial positions" relative to those of the unmodified PSF, as shown in Fig. 4 of the present application. Optical elements of Dixon cannot produce the same result. The claimed optical element modifies <u>the location</u> of the secondary maxima of the corresponding PSF, as specifically claimed in Claim 1. An example of a transmission property of such a component is shown in Fig. 6. As explained in the specification, such an optical component exhibits, for example, locally different filter properties (paragraph [22]), or according to the description of optical properties of the component in paragraph [44]. In other words, the optical component of the present invention as claimed in Claim 1 exhibits non-uniform (or non-homogeneous) properties, contrary to the optical components in Dixon. The cited paragraphs of the specification support the language in Claim 1 that the optical component modifies the PSF to make its secondary maxima located at different positions relative to those of the unmodified PSF. There is no such optical component in Dixon, explicitly or inherently, so the Patent Office should withdraw its rejection of Claim 1 over Dixon under both 35 U.S.C. 102(b) and 103(a). Note also, Engelhard alone or in combination with Krause does not teach or suggest or

mention an optical element that modifies the location of the secondary maxima of the corresponding PSF, as specifically claimed in Claim 1.

It is well established that a claim is anticipated under 35 U.S.C. §102, only if each and every element of the claim is found in a single prior art reference.[1] Moreover, to anticipate a claim under 35 U.S.C. §102, a single source must contain each and every element of the claim "arranged as in the claim."[2,3] Missing elements may not be supplied by the knowledge of one skilled in the art or the disclosure of another reference.[4] If each and every element of a claim is not found in a single reference, there can be no anticipation. Dixon does not describe the element of modifying the location of the secondary maxima of the corresponding PSF.

For an obviousness rejection to be proper, the Patent Office must meet the burden of establishing a prima facie case of obviousness. The Patent Office must meet the burden of establishing that all elements of the invention are disclosed in the cited publications, which must have a suggestion, teaching or motivation for one of ordinary skill in the art to modify a reference or combined references.[5] The cited publications should explicitly provide a reasonable expectation of success, determined from the position of one of ordinary skill in the art at the time the invention was made.[6] As argued above, this burden has not been met.

Argument with respect to the Second Group

The arguments presented above with respect to the First Group of claims are repeated herein in their entirety.

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1 *Veregal Bros. v Union Oil Co. of California, 814 F.2d 628, 631, 2USPQ2d 1051, 1053 (Fed. Cir. 1987).*
2 *Structural Rubber Prods. Co. v. Park Rubber Co., 749 F.2d 707, 716, 223 U.S.P.Q. 1264, 1271 (Fed. Cir. 1984).*
3 *Lewmar Marine Inc. v. Barient, Inc., 827 F.2d 744, 747, 3 U.S.P.Q. 2d 1766, 1768 (Fed. Cir. 1987), cert. denied, 484 U.S. 1007 (1988).*
4 *Titanium Metals Corp. v. Banner, 778 F.2d 775, 780, 227 U.S.P.Q. 773, 777 (Fed. Cir. 1985).*
5 *In re Sang Su Lee, 277 F.3d 1338, 61 USPQ2d 1430 (Fed. Cir. 2002).*
6 *In re Fine, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988); In re Wilson, 165 U.S.P.Q. 494, 496 (C.C.P.A. 1970);*
  Amgen v. Chugai Pharmaceuticals Co., 927 U.S.P.Q.2d, 1016, 1023 (Fed. Cir. 1996);

The Patent Office also asserts with respect to Dixon that: "The polarizing elements used in the light path will act as an optical element for varying the phase or polarization of the light and thereby to modify the shape of illuminating light and/or detected light." Dixon does not anticipate any of the claims of this group, because none of these claims claim a polarizer.

With respect to obviousness, the Patent Office states: "If it not inherent then it would have been obvious to one skilled in the art to modify the microscope provided by Dixon et al by utilizing any suitable polarizing element in each of the illuminating light path and detecting light path for the purpose of reducing the intensity caused by secondary maxima of an overall point spread function to obtain an image with better quality."

It would not have been obvious to a person having ordinary skill in the art that a polarizer can be made to modify the shape of a PSF, either at all, or in a desirable fashion, as does the present invention. As confocal scanning microscopes are used to examine biological specimens which contain water with randomly moving molecules (because of their random dipole motion), incident polarized light is reflected by such specimen with random polarization. See, for example, the work of Prof. Haeberle (Appendix B and Supplemental IDS). The set of figures labeled "Point Spread Functions for a theta microscope" shows that in the case of molecular free rotation, as it is in the specimen in a confocal microscope, the PSF <u>is not affected</u> by different polarization of a polarizer in the optical path between the specimen in a confocal microscope and the image. The set of figures immediately below shows that in the non-random case the PSF is split into 2- and 4-lobed shapes, depending on the polarization states of the molecules in the specimen, rather than a desirable, single lobed PSF. As follows from those sets of figures, experts have believed that polarizers have had either no effect on the PSF, or totally split up the PSF, depending on the nature of the sample, but in any case polarizers have not shifted the axial positions of the same PSF, as claimed in the present invention. Therefore, a person having ordinary skill in the art would not be motivated to interchange the amplitude and phase filters, retardation plates, LCDs, deformable mirrors or dichroic filters of this group of claims of the present invention for the polarizers of Dixon.

For the foregoing reasons, Applicants believe that the pending rejections should be withdrawn, and that the present application should be passed to issue. Should any questions arise, please contact the undersigned.

Respectfully submitted,

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Date: July 20, 2004

Appendix

1. (Previously presented) A double confocal scanning microscope comprising:

   - a light source defining an illuminating beam path with an inherent unmodified illumination point spread function (PSF), the illuminating beam path having a length;

   - a detector defining a detection beam path with an inherent unmodified detection point spread function (PSF), and

   - two spaced apart microscope objectives for focusing light propagating along the illumination beam path onto a specimen which is disposed in a common specimen plane defined by the two microscope objectives, the length of the illuminating beam path being the same for both microscope objectives; and

   - at least one optical component disposed in the illuminating or detection beam path, wherein the optical component is configured to vary the amplitude, phase or polarization of the light and thereby to modify a shape of the unmodified illumination PSF of the light in the illuminating beam path to produce a modified illumination PSF or of the unmodified detection PSF in the detection beam path to produce a modified detection PSF, wherein secondary maxima of modified and unmodified PSFs are located at different axial positions causing reduction of intensity of secondary maxima of an overall PSF produced by the modified illumination PSF and/or modified detection PSF.

3. (Previously presented) The double confocal scanning microscope as defined in Claim 1, wherein the unmodified illumination PSF in the illumination beam path and the unmodified detection PSF in the detection beam path shows axially arranged secondary maxima both of which are modifiable as to their shape or position.

4. (Previously presented) The double confocal scanning microscope as defined in Claim 1, wherein the optical component is used to increase the distance between a principal maximum of the modified illumination PSF in the illumination beam path or a principal maximum of the modified detection PSF in the detection beam and secondary maxima.

6. (Previously presented) The double confocal scanning microscope as defined in Claim 1, wherein the optical component is used to locate the secondary maxima of the modified illumination PSF in the illuminating beam path or the modified detection PSF in the detection beam path at different axial positions.

8. (Previously presented) The double confocal scanning microscope as defined in Claim 1, wherein the optical component modulates the wave front of the illuminating light or detection light.

9. (Previously presented) The double confocal scanning microscope as defined in Claim 1, wherein the optical component is disposed in a pupil of at least one microscope objective or in a plane optically conjugated therewith.

10. (Previously presented) The double confocal scanning microscope as defined in Claim 1, wherein the optical component is disposed at any desired location in the illuminating beam path or the detection beam path.

11. (Previously presented) The double confocal scanning microscope as defined in Claim 1, wherein the optical component is an amplitude filter and a phase filter.

12. (Previously presented) The double confocal scanning microscope as defined in Claim 1, wherein the optical component is a retardation plate or phase plate.

13. (Previously presented) The double confocal scanning microscope as defined in Claim 1, wherein the optical component is an LCD (liquid crystal device) arrangement.

14. (Previously presented) The double confocal scanning microscope as defined in Claim 1, wherein the optical component is configured as partially amplitude-modifying elements.

15. (Previously presented) The double confocal scanning microscope as defined in Claim 1, wherein the optical component is configured as an adaptive optical system comprising a deformable mirror.

16. (Previously presented) The double confocal scanning microscope as defined in Claim 1, wherein the optical component is embodied as a dichroic filter that is disposed in the illuminating beam path or the detection beam path.